

# **EXHIBIT D**

## **Redacted Supplemental Expert Report of Hal J. Singer**

**IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF NEVADA**

IN RE:	)	Case No.: 2:15-cv-01045-RFB-(PAL)
	)	
Cung Le, Nathan Quarry, Jon Fitch, Brandon Vera,	)	CLASS ACTION
Luis Javier Vazquez, and Kyle Kingsbury,	)	
on behalf of themselves and all others similarly	)	
situated,	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	
	)	<b>SUPPLEMENTAL EXPERT</b>
	)	<b>REPORT OF HAL J. SINGER, PH.D.</b>
Zuffa, LLC, d/b/a Ultimate Fighting Championship	)	
and UFC,	)	
	)	
Defendant.	)	

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## INTRODUCTION

1. I have been asked by counsel for Plaintiffs to respond to Dr. Topel’s Surrebuttal Expert Report.<sup>1</sup> Having carefully reviewed his new arguments and analyses, I am not persuaded to revise any of my prior opinions. Dr. Topel’s new critiques are contrary to my understanding of the record, and unsupported by basic principles of economics.

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1. Surrebuttal Expert Report of Professor Robert H. Topel (February 12, 2018) [hereafter “Topel Surrebuttal Report”].

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### QUALIFICATIONS

2. My qualifications and CV are contained in my prior reports.<sup>2</sup>

#### I. MY WAGE SHARE ANALYSIS IS THE APPROPRIATE FRAMEWORK FOR ASSESSING THE CHALLENGED CONDUCT

3. As detailed in my prior reports, I have extensively analyzed the relationship between (1) the Challenged Conduct,<sup>3</sup> as measured by share of Fighters locked up by Zuffa into long-term restrictive contracts (“foreclosure share”); and (2) the share of bout-specific revenue (“Event Revenue”) that Zuffa pays to Fighters participating in those bouts (“wage share” or “labor share”).<sup>4</sup> My analysis demonstrates that the wage share paid by Zuffa to its Fighters has decreased as Zuffa’s foreclosure share has increased, even after controlling for more than 1,500 additional factors that could also influence the wage share.<sup>5</sup> Dr. Topel has recognized this basic empirical fact.<sup>6</sup>

4. As explained below, Zuffa’s economists first claimed that my analysis should be disregarded because (according to them) it is economically incorrect to use wage shares to analyze

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2. Expert Report of Hal J. Singer, Ph.D. (August 31, 2017) [hereafter “Singer Report”]; Expert Rebuttal Report of Hal J. Singer, Ph.D. (January 12, 2017) [hereafter “Singer Rebuttal Report”].

3. Singer Report ¶2.

4. Singer Report ¶¶180-187; Singer Rebuttal Report ¶¶72-87.

5. Singer Rebuttal Report ¶124; Singer Report ¶¶180-187.

6. Expert Report of Professor Robert H. Topel (October 27, 2017) [hereafter “Topel Report”], ¶27 (“[Zuffa’s] share of MMA fighters under contract rose while compensation *as a share of event revenue declined*.”) (emphasis original); *see also* Topel Dep. at 50:6-51:2 (“Q. So would you agree that in general the share of UFC Event Revenue going to fighters did, in fact decline over time, say, from 2009 to 2016 even as fighter compensation measured in dollars per fight increased? A. .... I think the evidence is that fighter compensation increased at a different rate, a . . . somewhat lower rate than the increase in revenues so that the ratio would be lower .... The ratio of fighter compensation to total event revenue . . . was on average lower as those revenues increased.”); *id.* at 250:11-251:7 (discussing ZFL-1484034-37) (admits that fighter share of revenue decreased after Zuffa purchased Strikeforce in 2010); *id.* at 252:1-16 (admits that fighter share of revenue decreased after Zuffa purchased WFA, WEC, and Pride in 2007) (discussing ZFL-1484034-37). *See also* Singer Report ¶¶271-272 (showing Zuffa’s Event Revenue growing significantly faster than Fighter compensation); *see also* Appendix Figure A1 (reporting Zuffa financial data originally included in Singer Report backup materials, showing Zuffa’s Event Revenue growing from \$4.5 million in 2001 to \$213.5 million in 2007, and to [REDACTED] in 2016).

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compensation.<sup>7</sup> Faced with abundant evidence to the contrary—showing that economists in general and sports economists in particular have analyzed wage shares extensively (and that even Zuffa’s economists have done so in their capacity as consultants)<sup>8</sup>—Dr. Topel has now shifted the goalposts: In his Surrebuttal, Dr. Topel asserts that my analysis of Fighter wage share is divorced from the extensive economic literature reviewed in my rebuttal report because, he claims, no paper (or expert report in a monopsony case) has used precisely the same dependent variable (wage share) *and* explanatory variable (foreclosure share) in a regression model as I have in this proceeding.<sup>9</sup> This new claim is misleading and irrelevant: As I explain below, I analyze the empirical relationship between changes in labor market restrictions and changes in the share of revenue paid to athletes. The existing economic literature clearly establishes that this is a perfectly valid—and indeed quite standard—line of inquiry for economic analysis, particularly when studying the impact of monopsony power.

5. In his Surrebuttal, Dr. Topel also makes the new claim that my analysis “requires the assumption that athletes are the only material drivers of revenue[.]”<sup>10</sup> This is patently false; none of my analyses makes this assumption. It is obvious that inputs other than the Fighters themselves are necessary to stage Live MMA Events, just as non-athlete inputs are necessary for the production of other professional sporting events. As explained below, the sports economics literature on wage shares does not assume that athletes are the only material drivers of revenue, and neither does my analysis here. My analysis allows the data to inform the extent to which

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7. Topel Report ¶¶127; ¶130; Expert Report of Professor Paul Oyer (October 27, 2017) [hereafter “Oyer Report”], Part V.A.

8. Singer Rebuttal Report ¶¶88-107.

9. Topel Surrebuttal Report ¶¶13-23.

10. *Id.* ¶¶16, ¶21 (“Dr. Singer’s approach...hinges on the assumption that only athletes have a material impact on revenue.”).

Fighters contribute to Zuffa's Event Revenue, and to determine whether and the extent to which the labor market restrictions imposed by the Challenged Conduct have reduced Fighter wage shares below what would have been earned under more competitive conditions. It does so using statistical benchmarks based on the share of revenue paid to Fighters under more competitive conditions—not by assuming that non-Fighter inputs are irrelevant.<sup>11</sup> Relatedly, none of my analyses implies, assumes, or concludes that Fighters would appropriate 100 percent of Event Revenue (or of any increase in Event Revenue) in the but-for world, just as no sports economist claims that that athletes would appropriate 100 percent of team revenue (or of any increase in team revenue), even under the most competitive conditions.

**A. In Contrast To Prior Claims, Dr. Topel No Longer Contends That Economists Do Not Use Wage Shares To Analyze Compensation**

6. In their initial reports, Zuffa's economists had claimed categorically that wage share is an inappropriate focus for economic analyses of compensation, and that my analysis of Fighter wage shares should therefore be disregarded in its entirety simply for using wage shares at all. Dr. Topel asserted that “standard economic models of competitive labor markets make predictions about the *level* of worker pay, not about worker pay as a *share* of revenue,”<sup>12</sup> and that wage share “is not a measure of anything useful or informative.”<sup>13</sup> Similarly, Dr. Oyer claimed “labor share is not an economically accepted way to evaluate worker compensation,”<sup>14</sup> and that “[l]abor share is

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11. Singer Rebuttal ¶3; ¶¶73-75; Singer Report ¶183.

12. Topel Report ¶130 (emphasis added).

13. *Id.* ¶127.

14. Oyer Report Part V.A.

not generally accepted in the field of labor economics as a method for determining compensation in a competitive labor market[.]”<sup>15</sup>

7. My rebuttal report demonstrated that these claims are simply false. My rebuttal report included an extensive review of relevant economic literature, documenting (1) that sports economists commonly analyze monopsony power using the share of revenue paid to athletes;<sup>16</sup> and (2) that economists have also analyzed wage shares in a range of non-sports industries.<sup>17</sup> My rebuttal report also demonstrated that Zuffa has used wage shares both in its ordinary course of business,<sup>18</sup> and in the preparation of its sale to WME.<sup>19</sup> It also explained that Dr. Topel used wage

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15. *Id.* ¶30. Although Dr. Blair did not critique my analysis of wage share specifically, he claimed that Professor Zimbalist’s analysis of the “labor share of total revenue going to athletes... and the labor share going to the athletes in UFC... is inconsistent with standard principles of economics.” Blair Report ¶12.

16. Singer Rebuttal ¶¶95-102, citing Gerald Scully, *Player Salary Share and the Distribution of Player Earnings*, 25(2) MANAGERIAL AND DECISION ECONOMICS, 77-86, 77 (2004) [hereafter “Scully (2004)”]; Lawrence Kahn, *The Sports Business as a Labor Market Laboratory*, 14(3) JOURNAL OF ECONOMIC PERSPECTIVES 75-94 [hereafter “Kahn (2000)”] at 81 (citing ANDREW ZIMBALIST, *BASEBALL AND BILLIONS* (New York: Basic Books 1992)); John Vrooman, *Theory of the Perfect Game: Competitive Balance in Monopoly Sports Leagues*, 34(1) REVIEW OF INDUSTRIAL ORGANIZATION 5-44, 42 (2009) [hereafter “Vrooman (2009)”]; John Vrooman, *The Economic Structure of the NFL* in *THE ECONOMICS OF THE NATIONAL FOOTBALL LEAGUE: THE STATE OF THE ART*, 22-25, 29 (KevinG. Quinn ed., Springer 2012) [hereafter “Vrooman (2012)”]; John Twomey & James Monks, *Monopsony and Salary Suppression: The Case of Major League Soccer in the United States*, 56(1) THE AMERICAN ECONOMIST 20-28 (2011) [hereafter “Twomey & Monks”]; ROBERT PINDYCK & DANIEL RUBINFELD, MICROECONOMICS 549 (Pearson 8th ed. 2013) [hereafter “PINDYCK & RUBINFELD”]; LIBBY RITTENBERG & TIMOTHY TREGARTHEN, PRINCIPLES OF MICROECONOMICS 356 (Flat World Knowledge 2009) [hereafter “RITTENBERG & TREGARTHEN”]; Kevin Murphy & Robert Topel, *The Economics of NFL Team Ownership*, Chicago Partners (2009).

17. Singer Rebuttal ¶¶103-107, citing ROY RUFFIN & PAUL GREGORY, PRINCIPLES OF MICROECONOMICS 331-36 (Harper Collins 5th ed. 1993); Sabien Dobbelaere & Jacques Mairesse, *Panel Data Estimates of the Production Function and Product and Labor Market Imperfections*, 28 JOURNAL OF APPLIED ECONOMETRICS 1-46, 2 (2013); David Autor, David Dorn, Lawrence Katz, Christina Patterson, & John Van Reenen, *Concentrating on the Fall of the Labor Share*, 107(5) AMERICAN ECONOMIC REVIEW: PAPERS & PROCEEDINGS 180-185 (2017); *id.* at 185 (citing: Nicholas Kaldor, *Capital Accumulation and Economic Growth*, in *THE THEORY OF CAPITAL*, 177-222 (F.A. LUTZ AND D.C. HAGUE EDS. St. Martin’s Press 1961); Michael W.L. Elsby, Bart Hobijn, and Aysegul Sahin, *The Decline of the U.S. Labor Share*, BROOKINGS PAPERS ON ECONOMIC ACTIVITY, 1-42 (2013) [hereafter “Elsby et al.”]; Loukas Karabarbounis & Brent Neiman, *The Global Decline of the Labor Share*, 129 (1) QUARTERLY JOURNAL OF ECONOMICS, 61-103; Matthew Rognlie, *Deciphering the Fall and Rise in the Net Capital Share: Accumulation or Scarcity?*, BROOKINGS PAPERS ON ECONOMIC ACTIVITY, 1-69 (2015); and Simcha Barkai, “Declining Labor and Capital Shares,” University of Chicago New Working Paper Series No. 2 (November 2016) [hereafter “Barkai”], available at <https://research.chicagobooth.edu/~media/5872fbeb104245909b8f0ae8a84486c9.pdf>); Paul Oyer & Scott Schaefer, *Personnel Economics: Hiring and Incentives*, in, IV THE HANDBOOK OF LABOR ECONOMICS, Ch. 20 (ORLEY ASHENFELTER AND DAVID CARD EDS. 2011); Jan De Loecker & Jan Eeckhou, “The Rise of Market Power and the Macroeconomic Implications,” NBER Working Paper No. 23687 (August 2017) [hereafter “De Loecker & Eeckhou”].

18. Singer Rebuttal ¶108.

shares in his capacity as a consultant to the NFL Players Association to study the impact of the 2006 Collective Bargaining Agreement on revenue allocation between players and owners,<sup>20</sup> and that Dr. Blair analyzed wage shares when consulting for Zuffa.<sup>21</sup>

8. In addition, Professor Manning—acknowledged by Dr. Oyer as “a recognized expert and leader in the...analysis of monopsony in labor markets”<sup>22</sup>—submitted a rebuttal declaration explaining that “[w]age share can be an appropriate way for a labour economist to analyse compensation,”<sup>23</sup> and that “[w]age share is an appropriate way to analyse the compensation of MMA fighters in this case.”<sup>24</sup> Dr. Oyer made much of the fact that Professor Manning’s seminal textbook on monopsony did not use any examples where wage share was the dependent variable.<sup>25</sup> In his report, Professor Manning clarified that the reason for this omission was that, in contrast to the instant case, the revenue data necessary to compute wages shares are generally not available to academic researchers.<sup>26</sup>

9. In light of these developments, Dr. Topel makes no attempt in his Surrebuttal to repeat or defend his original claim that wage share “is not a measure of anything useful or

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19. *Id.*, n. 407 (citing WME-ZUFFA-0001150, at 11).

20. Singer Rebuttal ¶¶101-102. Dr. Topel claims that “[My] study [using labor share] does not analyze how much NFL players should be paid, or would be paid in a competitive marketplace, it only analyzes whether NFL teams could afford to pay players the amounts that had been agreed to in the CBA.” Topel Surrebuttal Report ¶20. This is hair splitting. Dr. Topel’s analysis of what the NFL “could afford” to pay its athletes (his clients) was obviously meant to inform what “should be paid” to the athletes.

21. Singer Rebuttal ¶101, n. 363.

22. Oyer Dep. 122:17-21 (“Alan Manning is a recognized expert and leader in the thinking of monopsony -- analysis of monopsony in labor markets. So his book and his handbook chapter are authoritative sources among labor economists.”).

23. Expert Rebuttal Report of Alan Manning (January 12, 2018), ¶5 [hereafter, “Manning Rebuttal”].

24. *Id.*

25. Oyer Report ¶22.

26. Manning Rebuttal ¶19 (“The data sets analysed in that book...are individual data sets containing only very limited information on employers...they contain no variable that would allow computation of wage share.”) As Professor Manning observed, “Dr. Oyer fails to give a single example in which a researcher was interested in comparing compensation with marginal revenue product and could have used worker wage share in an empirical investigation but chose not to do so.” *Id.* ¶20.



informative.”<sup>27</sup> Nor could he. More generally, none of Zuffa’s economists has attempted to resuscitate his prior categorically false claims regarding economists’ analysis of wage shares. Instead, Dr. Topel has shifted the goalposts.

**B. Dr. Topel Now Illogically Claims That My Wage Share Analysis Is Somehow Distinct From Any Other Wage Share Analysis Ever Published By Any Economist**

10. Dr. Topel now claims in his Surrebuttal that my wage share analysis is distinct from any wage-share analysis ever previously published by any economist, and that therefore the extensive empirical economic literature on wage share (which he had previously claimed did not exist) somehow provides no support for my own approach in this case.<sup>28</sup> Dr. Topel is wrong, and his reasoning is incoherent. He asserts that “many”<sup>29</sup> of the published studies cited in my rebuttal report, “do not purport to diagnose the existence of monopsony power”<sup>30</sup>—a clear admission that *at least some* economists have analyzed wage share for the express purpose of analyzing monopsony power.

11. Similarly, Dr. Topel claims that *some* of the articles cited in my rebuttal report do not use revenue as a proportional proxy for marginal revenue product (“MRP”)—a clear admission that economists *have* conducted analyses consistent with the empirically and factually supported point in this case that, as in many other professional sports, the athletes (here the Fighters) are a key driver of Zuffa’s Event Revenue.<sup>31</sup> Under these conditions, a *change* in Event Revenue is a

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27. Topel Report ¶127.

28. Topel Surrebuttal Report ¶¶13-23.

29. *Id.* Part II.B.4.

30. *Id.*

31. Topel Surrebuttal Report ¶¶15-16.

suitable proxy for a *change* in Fighter MRP over that same period. In other words, Fighter MRP is, holding other factors constant, proportional to (although not equal to) Event Revenue.<sup>32</sup>

12. Dr. Topel also claims that some of the studies cited in my rebuttal report “do something different”<sup>33</sup> than what I did in my analysis. What is “different” about these studies (according to Dr. Topel) is that they analyze the effect on the wage share of a “known change”<sup>34</sup> in monopsony power, as opposed to its mere “existence,” “such as eliminating the reserve clause in baseball,”<sup>35</sup> which “has clear implications for [athlete] compensation.”<sup>36</sup> Dr. Topel is certainly correct that eliminating the reserve clause increased athlete wage shares, but he fails to recognize the clear parallels between these purportedly “different” studies and my own analysis: In each case, the analytical focus is on the empirical relationship between *changes* in labor market restrictions and *changes* in the share of revenue paid to athletes. The economic literature clearly establishes that this is a perfectly valid line of inquiry for economic study.<sup>37</sup> My analysis of wage shares in this case adopts the same fundamental approach, using standard multiple regression techniques to analyze the empirical relationship between changes in labor market restrictions (measured by changes in the proportion of Fighters locked up by long-term exclusive contracts), and changes in the wage share paid to Fighters.<sup>38</sup> My analysis demonstrates that the wage share

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32. Singer Rebuttal Report ¶5.

33. Topel Surrebuttal Report ¶22.

34. *Id.*

35. *Id.*

36. *Id.*

37. Singer Rebuttal Report ¶¶95-102 (articles listed in n. 16, *supra*).

38. Dr. Topel conceded that eliminating the challenged contractual provisions would create “a transfer of wealth from Zuffa to the athletes,” and that eliminating the challenged contractual provisions could enhance fighter mobility and lead to higher fighter compensation, at least in the short run. Singer Rebuttal Report ¶71, citing Topel Dep. at 76:4-77:3; *id.* at 84:11-18 (“Q. It’s a transfer of wealth, in your view, from Zuffa to the fighters because in this instance Zuffa would either have to pay the fighters more or someone else would pay the fighters more, right? ... A. I think I see where you’re going with it and yes.”); *id.* at 84:25-85:5 (“Q. So for the existing stock of Zuffa athletes eliminating the challenged contracts, at least in the short run, would enhance fighter mobility and lead to higher fighter compensation, correct? A. It could do that.”); *id.* at 86:1-11 (“Q. Is it fair to say in the short run if we eliminate the

did, in fact, decrease as Zuffa's foreclosure share has increased (even after holding scores of other factors constant). If it had been otherwise (for example, if the wage share had remained fixed, rather than declining), my analysis would not have found that the Challenged Conduct reduced Fighter compensation.

**1. My Wage Share Analysis Follows Standard Methods Employed in the Economic Literature.**

13. My wage share analysis flows directly from prior analyses that economists have implemented in studying other professional sports. As explained in my rebuttal report, economists have analyzed wage shares in all major professional sports, and have found in published studies that the share of revenue paid to athletes has increased as labor market restrictions have been relaxed.<sup>39</sup> Similarly, my own analysis measures the relationship between the wage share of Zuffa Fighters and the labor market restrictions imposed by the challenged contracts. The key difference between my own analysis and that performed in prior work is that, in the context of this litigation, I have access to a much larger and more granular database than the typical academic researcher. This allows me to analyze wage shares using standard multivariate regression methods, whereas academic researchers have frequently been limited to simpler before-after comparisons to trace the impact of a change in labor mobility restrictions on wage shares. My application of a *more rigorous* method to a more granular data set could hardly invalidate my approach.

14. When limited to publicly available data, sports economists have been forced to analyze wage shares at a highly aggregated level (such as calculating the annual share of revenue paid to athletes within a given sport). For example, in a 2004 article published in *Managerial and*

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challenged contractual provisions, one immediate effect is that fighters get paid closer to the amount of Event Revenue that they generate for the promotion; is that fair? ... A. They'll get paid more than they would have because they're getting some of the returns on the investment that were previously shared with – with the investing firm.”).

39. Singer Rebuttal Report ¶¶95-102 (articles listed in n. 16, *supra*).

*Decision Economics*, Professor Scully analyzed athlete compensation as a percentage of the revenues for baseball, basketball, football, and hockey.<sup>40</sup> As seen in Table 1 of that article (reproduced below), the analysis was limited to annual wage shares, intermittently available between the early 1970s and the late 1990s, yielding a total of just eleven data points for each sport:

<b>Table 1. Player Compensation as a Share of Revenue in Profession Team Sports</b>				
<b>Year</b>	<b>MLB</b>	<b>NBA</b>	<b>NFL</b>	<b>NHL</b>
1970/73	15.9	46.1	34.4	21.3
1980	31.3	NA	35.4	NA
1990	31.6	40.6	41.0	30.0
1991	45.3	39.3	47.2	32.6
1992	57.8	43.8	59.6	39.1
1993	56.5	49.5	69.8	40.7
1994	63.4 <sup>a</sup>	41.4	64.1	41.4
1995	61.9 <sup>a</sup>	46.2	65.3	38.2 <sup>a</sup>
1996	53.6	46.9	60.1	51.1
1997	50.6	NA	53.4	NA
1998	48.4	54.2	55.4	58.4

<sup>a</sup> Shortened season due to player-management contract dispute. Sources: For 1990–1996, except for player salary in football, figure is player compensation divided by total revenue from *Financial World*. For football (1992–1998), total player pay was provided by the NFLPA. For 1997 and 1998, data is from *Forbes*. Earlier data is from Scully (1989, p. 112), and from various Congressional Hearings in 1976 and 1982.

Nonetheless, the wage shares in Table 1 are economically informative as to the effect of changes in labor market restrictions on athlete compensation. As Dr. Scully explains, low wage shares in the earlier years reflect tight labor market restrictions; the effect was particularly pronounced for baseball and hockey, given the absence of interleague competition:

Prior to veteran free agency, players were restricted in their ability to move between clubs...The result of these restrictions was that player salary or compensation as a share of league revenues was rather small...in 1970-1973, players got somewhat less than 16% of revenues in baseball, and about 21% in ice hockey. Major league baseball and the National

40. Singer Rebuttal Report ¶95, citing Scully (2004). See also Singer Rebuttal ¶¶95-102 (reviewing other analyses of athlete compensation as a share of revenue).

Hockey League had the most restrictive labor market rules. In football and basketball, player salary share was higher in this period. Players benefited, at various times, from interleague competition in football (AFL 1960-1969, WFL 1974-1975, USFL 1983-1985), basketball (ABA 1968/60-1975/76), and in hockey (WHA 1972/73-1978/79). This competition put considerable upward pressure on player salaries. While the labor market was restricted de jure, the prospect of players jumping to the competing leagues forced salaries and the player share of revenues upward.<sup>41</sup>

15. In contrast to the limited, low-frequency wage share data seen above, in this litigation, I have access to a wealth of information, including financial records reporting the Event Revenue generated at specific Live MMA Events featuring a set of specific Fighters during (and before) the Class Period, and event-specific compensation paid to each MMA Fighter who was featured in said event. In total, I have access to wage share data encompassing 1,396 Fighters participating in 353 MMA events between 2005 and 2016.<sup>42</sup> This type of granular information on wage shares is not widely available in other professional sports, such as baseball and football: For these sports, event-specific revenue are confidential, and hence generally unavailable to academic researchers. Even if a researcher could obtain, for instance, data on event-specific revenue streams for individual baseball games (such as box office receipts and broadcast license fees), there would be no way to compute event-specific wage shares: Baseball players, like most professional athletes, are not compensated on a per-game basis, and receive compensation more akin to that of employees with annual salaries. This difference in technique due to the lack of granular data in prior analyses is hardly an indictment of my methods, as suggested by Dr. Topel.

16. With an abundance of granular data, I can undertake a regression analysis that controls for more than 1,500 factors (a total of 270 control variables, in addition to 1,396 Fighter

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41. Scully (2004) at 78.

42. Taken together yields a total of 7,154 observations. Includes Zuffa bouts and Strikeforce pre-acquisition bouts. Singer Report Table 6; Singer Rebuttal Report Appendix Table A2.

“fixed effects”).<sup>43</sup> This allows me to implement a significantly *more rigorous* version of prior published economic analyses of wages shares. Nonetheless, the fundamental approach is directly analogous to prior published work. Prior published studies have evaluated the effect of changes in labor market restrictions such as changes in the reserve clause on changes in athlete wage shares in major professional sports; my own analysis studies the effect of an increase in the prevalence of long-term restrictive contracts on the wage shares of Zuffa Fighters. In each case, the analytical focus is on the empirical relationship between labor market restrictions and the wage share.

**2. My Wage Share Analysis, Like the Economic Literature on Wage Shares, Does Not Assume that Athletes Are Solely Responsible for Generating Event Revenue.**

17. In his Surrebuttal, Dr. Topel makes the new and false claim that my analysis, or indeed any analysis that uses wage shares, “requires the assumption that athletes are the only material drivers of revenue[.]”<sup>44</sup> As should be clear from my prior reports, my analysis does not make this assumption, nor does the economic literature on wage shares. My wage share analysis allows the data to inform the extent to which Fighters contribute to Zuffa’s Event Revenue. In particular, my wage share analysis makes use of two key statistical benchmarks.<sup>45</sup> The first is based on the share of revenue paid to Zuffa Fighters when Zuffa had foreclosed a smaller proportion of the market, and thus had less monopsony power.<sup>46</sup> The second is based on the share

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43. Singer Rebuttal Report ¶36; Singer Report ¶¶180-187.

44. Topel Surrebuttal Report ¶16; *id.* ¶21 (“Dr. Singer’s approach...hinges on the assumption that only athletes have a material impact on revenue.”)

45. Singer Rebuttal Report ¶3; *id.* ¶¶73-75; Singer Report ¶183.

46. Singer Rebuttal Report ¶74.

of Event Revenue that Strikeforce paid its own Fighters before Zuffa acquired it.<sup>47</sup> According to both benchmarks, non-Fighter inputs contribute significantly to MMA revenue.<sup>48</sup>

18. Relatedly, none of my analyses implies, assumes, or concludes that Fighters would appropriate 100 percent of Event Revenue (or of any increase in Event Revenue) in the but-for world,<sup>49</sup> just as no published article in the sports economics literature concludes that athletes would receive 100 percent of team revenue (or of any increase in team revenue), even under the most competitive conditions. For example, Dr. Scully estimated that “under unrestricted free agency for all players, the upper bound on player compensation as a share of revenue in team sport would approach about 70%;”<sup>50</sup> similarly, the sports economist John Vrooman estimated that “[a]ll [major sports] leagues have similar carrying capacities for player costs at two-thirds of revenues and current payroll cap percentages are almost identical at about 60 percent.”<sup>51</sup> Consistent with this literature, my analysis finds that Zuffa would continue to appropriate a significant share of the Event Revenues generated in the but-for world.

19. It bears emphasis that the many control variables included in my analysis are *held constant* between the actual and but-for worlds. To illustrate, among the many control variables included in my analysis are Fighter-specific factors that relate to a Fighter’s performance in a specific bout (such as Total Knockdowns, Total Strikes Landed, whether the Fighter won the bout, and so on),<sup>52</sup> as well as a Fighter’s overall prominence and popularity (such as the Fighter’s rank,

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47. *Id.* ¶75.

48. For example, Strikeforce paid approximately 63 percent of its revenue to Fighters (and thus 37 percent to non-Fighter inputs) before it was acquired by Zuffa. Singer Report ¶248; *id.* Table 9.

49. Singer Report Tables 9-11.

50. Singer Rebuttal Report ¶96 (citing Scully (2004), at 80).

51. *Id.* ¶97 (citing Vrooman (2009)).

52. Singer Report Table 4 (showing bout-specific performance variables from FightMetric, such as Total Knockdowns, Total Strikes Landed, Submissions Attempted, etc.).



win/loss record, eligibility for PPV royalties, weight class, Fighter “fixed effects,” etc.).<sup>53</sup> For example, the Fighter-specific factors included in my analysis account for the fact that a superstar such as Conor McGregor receives a higher fraction of Event Revenue than other Fighters in the actual *and* but-for worlds. My analysis does not predict that even a superstar such as McGregor would capture all (or almost all) Event Revenue in the but-for world; to the contrary, the effect of McGregor’s superstardom on his share of Event Revenue is held fixed between the actual and but-for worlds.

**3. My Wage Share Analysis, Like the Economic Literature on Wage Shares, Uses Revenue Directly Traceable to Athletes as a Proxy for MRP.**

20. The wage share used in my analysis is the ratio of Fighter compensation at a particular event featuring that Fighter to the Event Revenue generated at that event. Event Revenue consists of revenue that is directly traceable to specific events involving specific Fighters, such as PPV buys, live event ticket sales, and so on.<sup>54</sup> This follows the standard approach in sports economics, which is to measure athlete compensation relative to the revenue generated by athletes—that is, relative to their MRP.<sup>55</sup> In some cases, sports economists have estimated MRP

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53. *Id.* Table 4 (showing controls such a Fighter’s rank, win/loss record, PPV royalty agreements, and Fighter “fixed effects,” which control for any individual, Fighter-specific attributes that remain constant over time); *id.* ¶184.

54. *Id.* ¶181, n. 451.

55. Singer Rebuttal Report ¶¶92-94. *See* MICHAEL KATZ & HARVEY ROSEN, MICROECONOMICS (Irwin McGraw-Hill 3rd ed. 1998), at 312-315, 417-419; RODNEY D. FORT, SPORTS ECONOMICS (Prentice Hall 3rd ed. 2011), at 206; ROGER BLAIR, SPORTS ECONOMICS (Cambridge University Press 2012) at 354-355; David Berri, Michael Leeds, & Peter von Allmen, *Salary Determination in the Presence of Fixed Revenues* 10 INTERNATIONAL JOURNAL OF SPORT FINANCE 5-25 (2015), at 6; Kahn (2000); Gerald Scully, *Pay and Performance in Major League Baseball*, 64(6) AMERICAN ECONOMIC REVIEW, 915-930 (1974) [hereafter “Scully (1974)”]; John Charles Bradbury, *What is Right with Scully Estimates of a Player’s Marginal Revenue Product*, 14(1) JOURNAL OF SPORTS ECONOMICS 87-96 (2013) at 93; Roger G. Noll, *Attendance and Price Setting*, in ROGER G. NOLL, GOVERNMENT AND THE SPORTS BUSINESS, 115-157 (Brookings Institution, 1974); Ira Horowitz, *Sports Broadcasting*, in ROGER G. NOLL, GOVERNMENT AND THE SPORTS BUSINESS, 275-323 (Brookings Institution, 1974); Gerald W. Scully, *Binding Salary Arbitration in Major League Baseball*, 21(3) AMERICAN BEHAVIORAL SCIENTIST 431-450 (1978); James Cassing and Richard W. Douglas, *Implications of the Auction Mechanism in Baseball’s Free Agent Draft*, 47(1) SOUTHERN ECONOMIC JOURNAL 110-121 (1980); Paul M. Sommers and Noel Quinton, *Pay and Performance in Major League Baseball: The Case of the First Family of Free Agents*, 17(3) THE JOURNAL OF HUMAN RESOURCES 426-436 (1982); Henry J. Raimondo, *Free*



for individual athletes, and then compared those estimates to the compensation received by each athlete. This approach is appropriate when: (1) the objective of the analysis is to measure the MRP of individual athletes; and (2) the revenue-generating ability of individual athletes must be teased out from aggregated revenue data.<sup>56</sup> In other cases, rather than estimate MRP for individual athletes, economists have often used the share of revenue returned to the players in the form of salaries as evidence of the degree of monopsony control.<sup>57</sup> In these studies, the degree of monopsony power is inferred by analyzing the relationship between labor market restrictions and the wage share paid to athletes.<sup>58</sup> That is the approach that I adopt in my wage share analysis.

21. Zuffa's economists recognize that the exercise of monopsony power is properly measured by the extent to which athletes are underpaid relative to their MRP.<sup>59</sup> This is precisely what my analysis measures. The only necessary factual underpinning for my analysis, as in prior studies, is that *change* in Event Revenue is a suitable proxy for a *change* in Fighter MRP over that same period, such that, all else equal, Event Revenue is proportional to (not equal to) Fighter MRP. And the evidence is clear that it is. As in other sports, in MMA, revenue generation changes

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*Agent's Impact on the Labor Market for Baseball Players*, 4(2) JOURNAL OF LABOR RESEARCH 183-93 (1983); James R. Hill and William Spellman, *Professional Baseball: The Reserve Clause and Salary Structure*, 22(1) INDUSTRIAL RELATIONS 1-19 (1983); Rodney D. Fort and Roger G. Noll, *Pay and Performance in Baseball: Modeling Regulars, Reserves and Expansion*, California Institute of Technology Social Science Working Paper 527 (May 1984), available at <https://authors.library.caltech.edu/81597/1/sswp527.pdf>; Roger G. Noll, *The Economics of Sports Leagues in* GARY A. UBERSTINE, LAW OF PROFESSIONAL AND AMATEUR SPORTS (Clark Boardman 1988); Monks (2013) at 3; Anthony Krautmann, *What's wrong with Scully-Estimates of a Player's Marginal Revenue Product* 37(2) ECONOMIC INQUIRY 369-381 (1999).

56. *Id.* ¶94. For example, to estimate the MRP of individual baseball players, Dr. Scully had first to perform regressions relating individual athlete performance to win probabilities, and then to perform regressions relating win probabilities to aggregate team revenue. *Id.*, citing Scully (1974), and related literature.

57. Singer Rebuttal Report ¶95.

58. *Id.* ¶¶95-100 (citing numerous economic analyses of wage shares in professional sports, from elementary textbooks to articles in professional journals, including Scully (2004); Kahn (2000); Vrooman (2009); Vrooman (2012); Twomey & Monks, at 20-28; PINDYCK & RUBINFELD; and RITTENBERG & TREGARTHEN).

59. Singer Rebuttal Report ¶90. In his Surrebuttal, Dr. Topel states: "I largely agree with Dr. Singer on this point. If one could reliably measure the MRP of Zuffa's athletes, a comparison of those athletes' compensation to their MRP could be informative in assessing whether, or to what extent, the Challenged Conduct anticompetitively reduced MMA athletes' compensation." Topel Surrebuttal Report ¶4.

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in proportion to athlete productivity. Thus, all else equal, if Fighter compensation fails to keep pace with the growth in Zuffa's Event Revenue—such that the wage share falls as Event Revenue rises—that is evidence of the exercise of monopsony power.<sup>60</sup> That is precisely what my econometric analysis finds, as do prior analyses of wage shares by sports economists.<sup>61</sup>

22. Dr. Topel claims in his Surrebuttal that Event Revenue at an event featuring a particular set of Fighters is “not a proxy for [those] athletes' MRP.”<sup>62</sup> This claim is incorrect. My finding that *changes* in Event Revenue are an excellent proxy for *changes* in Fighter MRP is confirmed by voluminous evidence in the record: As in other professional sports, Fighters are the major draw for MMA consumers, and thus are a key driver of Zuffa's Event Revenue.<sup>63</sup> It is nearly tautological: Matchups involving popular, highly-ranked, headlining Fighters sell more PPV buys, event tickets, and so on, than do matchups involving less prominent opponents.<sup>64</sup>

23. That growth in Event Revenue is a suitable proxy for growth in Fighter MRP is also confirmed by Dr. Topel's own testimony. For example, Dr. Topel admitted that “one of the reasons why athlete talent is valuable is because the athletes are capable of generating revenues for the organization,”<sup>65</sup> and opined that Zuffa is in the business of “causing its fighters to be more

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60. Singer Rebuttal Report ¶5.

61. Singer Rebuttal Report ¶¶95-102 (articles listed in n. 16, *supra*).

62. Topel Surrebuttal Report ¶5.

63. Singer Report ¶20 (citing record evidence demonstrating that MMA promoters rely on high-profile, highly-ranked Fighters at the Top of the Card to draw audiences); *id.* ¶28 (“the fighters themselves, not the UFC titles, are what truly drive PPV buy rates,” citing Richard McGowan and John Mahon, *Demand for the Ultimate Fighting Championship: An Econometric Analysis of PPV Buy Rates* 6(6), JOURNAL OF BUSINESS & ECONOMICS 1032-1056, 1047 (2015) [hereafter “McGowan & Mahon”]); Singer Report ¶¶156-164 (showing that Zuffa and market analysts such as Deutsche Bank and Moody's recognized that other MMA promoters could not compete effectively without a deep roster of talented Fighters, and that the challenged contracts deprived other MMA promoters of this critical input).

64. Singer Rebuttal Report ¶132 (showing that Zuffa relies heavily on Headliners (top 15 Fighters) to fill the Top of the Card, and that at least one of the Fighters at the Top of the Card was a Headliner in 158 of 159 events UFC PPV events from 2005 to May 2017; *id.* ¶130 (showing that variation in Fighter rank explains 93.2 percent of the variation in average Event Revenue, and 92.5 percent in the variation in average Fighter compensation).

65. *Id.* ¶113, n. 420, citing Topel Dep at 27:22-25.

effective revenue generators.”<sup>66</sup> By definition, a fighter can only be a “more effective revenue generator” to the extent that his or her MRP has increased. Dr. Topel also confirmed that “one thing that WME would want to know before it invests \$4 billion in Zuffa is that Zuffa has its top-ranked fighters under long-term exclusive contracts,”<sup>67</sup> owing to the revenue-generating ability of those Fighters.

24. My rebuttal report explained that, having conceded that the Challenged Conduct constitutes an exercise of Zuffa’s monopsony power to suppress Fighter compensation, Dr. Topel is left to speculate, without evidence, that these benefits to Fighters would be transitory because removal of the Challenged Conduct would result in lower investment in MMA over the long run.<sup>68</sup> In his Surrebuttal, Dr. Topel reiterates his unsupported speculation that the Challenged Conduct, as measured by Zuffa’s foreclosure share, reflects “investments [that] raise the demand for Zuffa-

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66. *Id.* ¶136, n. 485, citing Topel Report ¶311; Topel Dep. at 24:20-25:9 (“Q. Okay. So if what Zuffa does is . . . makes its fighters more effective revenue generators, then what you were saying is that Zuffa in this example is causing the marginal revenue product of its fighters to increase, correct? A. Yes. Q. And is it your opinion that Zuffa is particularly good at is causing its fighters to be more effective revenue generators? A. I think that’s Zuffa’s position and I think that’s what the evidence tends to show, yes. Q. Is it your opinion? A. I just said yes.”). *Id.* at 77:22-78:6 (“Q. So, in your view, because Zuffa has invested in promoting these athletes they [are] as a group are more valuable...to a rival promoter than unranked fighters sitting in an MMA gym somewhere; is that right? A. I think what you said is right, yeah. Q. And what it means to be more valuable in this context is these fighters are capable of bringing in more revenues when they fight, correct? A. Yeah ...”). *See also id.* at 36:24-37:4 (“Q. What you’re saying is that one of the ways in which Zuffa has become successful is by boosting the ability of its fighters to generate revenues when they fight, correct? A. Yeah. The point of investing is to generate revenues.”). Dr. Topel admitted that promotion contributes to an athlete’s human capital. *Id.* at 28:22-25. Dr. Topel acknowledged further that the more human capital an MMA fighter has, all things equal, the more revenues he’s capable of generating when he fights. *Id.* at 29:6-12. Dr. Topel also admitted that Zuffa’s promotional efforts in creating The Ultimate Fighter increased the MRP of MMA fighters generally. *Id.* at 31:7-13 (“Q. Did that promotional effort in creating the show increase the marginal revenue product of MMA fighters generally? A. You mean – when you say generally, you mean like at other – Q. Yes. A. For other promoters and everything, yes.”). Dr. Topel additionally conceded that a fighter who is a household name because of Zuffa’s investments and promoting that fighter, all things equal, would generate more revenues for the UFC when he fights than a fighter who is not a household name. *Id.* at 37:24-38:8.

67. Singer Rebuttal Report ¶113, citing Topel Dep. at 241:4-16 (discussing WME-ZUFFA-00001150) (“Q. So one thing that WME would want to know before it invests \$4 billion in Zuffa is that Zuffa has its top-ranked fighters under long-term exclusive contracts, rights? A. Yeah. You want to know you’re not going to lose them in the short run. Q. Why is that? Why would you want to know that? A. Because that’s the human capital that’s going to produce revenue for you over the short run and the champions are more valuable than the guys ranked 11 to 15. And if we went down to the people ranked 50, they’d be less valuable still.”).

68. Singer Rebuttal Report ¶213.

promoted events and also raise the share of highly rated athletes that contract with Zuffa.”<sup>69</sup> According to Dr. Topel, Zuffa’s foreclosure share reflects “Zuffa’s own investments and efforts in increasing the value of the events and athletes it promotes,”<sup>70</sup> thereby increasing Zuffa’s revenue.<sup>71</sup>

25. These assertions mirror prior claims made by Dr. Topel that “[t]he [challenged] contract provisions are efficient and procompetitive responses to contracting externalities and transactions costs that would otherwise hinder promoters’ investments in the quality and marketability of MMA Fighters and events.”<sup>72</sup> As my rebuttal report explained, Dr. Topel has provided no evidence that the Challenged Conduct increased investments in Fighters specifically or MMA generally.<sup>73</sup> The same is true of Dr. Topel’s Surrebuttal.

26. Further, even if Dr. Topel had evidence that the Challenged Conduct incentivized investments on Zuffa’s part that caused Zuffa’s Event Revenue to increase, that would still not imply that these investments would cause Fighters’ wage share to decrease. For this to be the case, one would have to assume that the net effect of “Zuffa’s own investments and efforts in increasing the value of the events and athletes it promotes”<sup>74</sup> is to *decrease* the revenue-generating ability of Fighters, relative to some other revenue-generating inputs that Zuffa relies upon to produce Live MMA Events. Under those unrealistic assumptions, an increase in Zuffa’s Event Revenue could flow *disproportionately* to these other revenue-generating inputs, leaving Fighters with a smaller wage share. But this implication contradicts all available evidence in the record, which shows that Zuffa relies on the revenue-generating ability of its Fighters, and has structured its contracts with

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69. Topel Surrebuttal Report ¶8.

70. *Id.*

71. *Id.* (“Event revenues increase when Zuffa’s investments are successful”).

72. Topel Report ¶25.

73. Singer Rebuttal Report ¶¶212-226.

74. Topel Surrebuttal Report ¶8.

Fighters to retain talent within the company long-term.<sup>75</sup> Zuffa's investments that raise Event Revenue necessarily must increase (not decrease) the MRP of its Fighters featured in that Event. Dr. Topel himself recognizes that Zuffa's success is driven by increases in Fighter MRP, which are reflected in increased Event Revenue.<sup>76</sup> Dr. Topel has provided no evidence for (nor has he even articulated) a plausible procompetitive mechanism that would somehow decrease the revenue-generating ability of Fighters, relative to non-Fighter inputs.

27. Relatedly, Zuffa claims in its *Daubert* motion that "if Zuffa increases its advertising and generates more viewers, wage share would decrease, but through a purely procompetitive effect."<sup>77</sup> This assumes (in contradiction to all available evidence and Dr. Topel's own claims) that Zuffa's promotional activities do *not* enhance the revenue-generating ability of its Fighters—that is, do not increase the MRP of the Fighters featured in a particular Event. In fact, the evidence shows that promotional expenditures are not a substitute for, but rather a complement to, a deep roster of high-quality Fighters. Because its Fighters are the only inputs on display during an event (besides the referee and announcers), it is implausible for Zuffa to promote an event in a way that does not increase the MRP of its Fighters. If Zuffa's contention were accurate, then Zuffa would

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75. Singer Report ¶20 (citing record evidence demonstrating that MMA promoters rely on high-profile, highly-ranked Fighters at the Top of the Card to draw audiences); *id.* ¶28 ("the fighters themselves, not the UFC titles, are what truly drive PPV buy rates," citing McGowan & Mahon, at 1047); *id.* ¶¶156-164 (showing that Zuffa and market analysts such as Deutsche Bank and Moody's recognized that other MMA promoters could not compete effectively without a deep roster of talented Fighters, and that the challenged contracts deprived other MMA promoters of this critical input). *See also* Singer Rebuttal Report ¶132 (showing that Zuffa relies heavily on Headliners (top 15 Fighters) to fill the Top of the Card, and that at least one of the Fighters at the Top of the Card was a Headliner in 158 of 159 events UFC PPV events from 2005 to May 2017; *id.* ¶130 (showing that variation in Fighter rank explains 93.2 percent of the variation in average Event Revenue, and 92.5 percent in the variation in average Fighter compensation).

76. Singer Rebuttal Report ¶113 (citing Topel Dep. at 23:24-24:3) ("Q. So when Zuffa makes its fighters more effective revenue generators, they're able to generate more revenues when they fight; is that fair? A. Yes."); *id.* at 24:20-25:9 ("Q. Okay. So if what Zuffa does is makes it – makes its fighters more effective revenue generators, then what you were saying is that Zuffa in this example is causing the marginal revenue product of its fighters to increase, correct? A. Yes. Q. And is it your opinion that Zuffa is particularly good at is causing its fighters to be more effective revenue generators? A. I think that's Zuffa's position and I think that's what the evidence tends to show, yes. Q. Is it your opinion? A. I just said yes.").

77. Zuffa Daubert Brief re Dr. Hal Singer at 19-20.

not need contracts to lock up top-ranked Fighters; Zuffa could populate the Top of the Card with mediocre Fighters and still earn the same (or greater) Event Revenues by “generat[ing] more viewers”<sup>78</sup> through advertising. According to this logic, Zuffa’s rivals could have supplanted its dominant position long ago by staging heavily promoted bouts featuring unremarkable Fighters.

28. Dr. Topel’s Surrebuttal also includes the new and incorrect claim that my impact regression “confuses the total revenue from an event with the change in revenues that is solely attributable to the presence of an athlete.”<sup>79</sup> This is false; my analysis involves no such confusion. As explained above, my analysis is based on the fact that *changes* in Event Revenues are a proxy for *changes* in Fighter MRP, such that the two are proportional (not equal). Moreover, my analysis controls for numerous factors capturing individual Fighter performance in a specific bout<sup>80</sup> as well as the overall prominence of individual Fighters.<sup>81</sup> My regression therefore explicitly measures and controls for any variation in Event Revenues or Fighter compensation that is “solely attributable to the presence of an athlete.”<sup>82</sup> For example, my analysis accounts for the fact that a superstar such as Conor McGregor may appropriate a higher fraction of Event Revenue than other Fighters, and holds this “McGregor fixed effect” constant between the actual and but-for worlds.<sup>83</sup>

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78. *Id.*

79. Topel Surrebuttal Report ¶8.

80. Singer Report Table 4 (showing bout-specific performance variables from FightMetric, such as Total Knockdowns, Total Strikes Landed, Submissions Attempted, etc.).

81. *Id.* Table 4 (showing controls such as a Fighter’s rank, win/loss record, PPV royalty agreements, and Fighter “fixed effects,” which control for any individual, Fighter-specific attributes that remain constant over time). *Id.* ¶184.

82. Topel Surrebuttal Report ¶8.

83. To illustrate, suppose that events without McGregor generate \$1 million in Event Revenue, and that the wage share is 20 percent in those events. Suppose further that events featuring McGregor generate \$2 million in Event Revenue, and that McGregor is compensated at \$500,000 per event, implying a wage share at events featuring McGregor of  $[0.2 \times \$1 \text{ million}] + \$0.5 \text{ million} / [\$2 \text{ million}] = 35$  percent. Under this fact pattern, the wage share at events featuring McGregor is 15 percentage points higher than the wage share at events that do not feature McGregor (equal to  $35 - 20$ ). My analysis measures this “McGregor effect,” and holds it constant between the actual and but-for worlds.



29. Zuffa also claims falsely in its *Daubert* motion that my analysis does not control for “factors that drive event revenues other than athlete pay.”<sup>84</sup> Similarly, Dr. Topel falsely implies that my analysis does not “account[] for other determinants of revenue,”<sup>85</sup> and that I fail to account for “procompetitive reasons”<sup>86</sup> for Fighters’ declining wage shares. This is incorrect. *First*, (as Zuffa concedes)<sup>87</sup> my analysis includes a time trend, which controls for the possibility that Zuffa’s non-Fighter inputs (such as Zuffa’s promotional acumen) have somehow contributed more over time to Event Revenue than Fighters, therefore allowing Zuffa to pay them a lower wage share.<sup>88</sup> In fact, my results indicate the opposite: The coefficient on the time trend is positive and significant, indicating that non-Fighter inputs have, if anything, become *less* productive relative to Fighter inputs over time.<sup>89</sup> This shows that, under more competitive conditions, Fighter compensation should have risen at least in proportion to Event Revenue, if not more rapidly.

30. *Second*, (as Zuffa also concedes)<sup>90</sup> my analysis controls for year-to-year fixed effects, which control for the possibility that, in each year from 2005 through 2016, the contribution of non-Fighter inputs to Event Revenue has shifted upward relative to that of Fighters.<sup>91</sup> Again, my results demonstrate that this is not the case: The coefficients on the year fixed effects are not statistically significant, indicating no significant year-to-year shifts in the

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84. Zuffa Daubert Brief re Dr. Hal Singer at 19-20.

85. Topel Surrebuttal Report ¶16. Relatedly, Dr. Topel cites “Zuffa’s promotional investments and efforts (both in its athletes and in its events),” as factors that may affect Zuffa’s Event Revenue. *Id.* ¶6.

86. *Id.* ¶23.

87. Zuffa Daubert Brief re Dr. Hal Singer at 19-20.

88. Singer Report ¶185; *id.* Table 6. *See also* JEFFREY WOOLDRIDGE, INTRODUCTORY ECONOMETRICS: A MODERN APPROACH 360 (Thompson 4th ed. 2009) [hereafter “Wooldridge”] (noting that time trend variables in a regression can help avoid the fallacy of concluding that “two time series processes appear to be correlated only because they are both trending over time for reasons related to other unobserved factors”).

89. Singer Report Table 6.

90. Zuffa Daubert Brief re Dr. Hal Singer at 19-20.

91. Singer Report ¶185; *id.* Table 6.

contribution of non-Fighter inputs to Zuffa's Event Revenue after the time trend is taken into account.<sup>92</sup>

31. *Third*, my analysis includes fixed effects by promoter.<sup>93</sup> This controls for the possibility that Zuffa has superior promotional acumen, and therefore captures a greater share of Event Revenue than other promoters. The coefficient on the UFC fixed effect is negative and statistically significant, indicating that the wage share is significantly lower at the UFC relative to other promoters.<sup>94</sup> Although this result could be interpreted as further evidence of Zuffa's monopsony power, attributable at least in part to the Challenged Conduct, my analysis conservatively assumes that this is not the case, and that the discrepancy would persist in the but-for world, conservatively attributing all of the effect to Zuffa's promotional acumen.

32. *Fourth*, the thousands of Fighter-specific control variables included in my analysis also control for the possibility that Zuffa deserves credit for making its Fighters more effective revenue generators. For example, to the extent that Zuffa can be credited with the ability of a superstar such as Conor McGregor to generate more Event Revenue than the average Fighter, my analysis already controls for this effect.<sup>95</sup>

33. Neither Dr. Topel nor Zuffa has presented any evidence that Zuffa's promotional activities (or any other non-Fighter input) had any significant effect on Zuffa's Event Revenue

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92. *Id.* Backup to Table 6. *See also* Wooldridge, *supra*, at 456.

93. *Id.* ¶185; *id.* Table 6.

94. *Id.* Backup to Table 6.

95. To illustrate, suppose that events without McGregor generate \$1 million in Event Revenue, and that the wage share is 20 percent in those events. Suppose further that events featuring McGregor generate \$2 million in Event Revenue, and that Zuffa's promotion accounts for 80 percent of the \$1 million in incremental Event Revenue. McGregor would receive \$200,000 per event, and the wage share at events featuring McGregor would be  $[\$0.2 \text{ million} + \$0.2 \text{ million}] / [\$2 \text{ million}] = 20 \text{ percent}$ . This is identical to the wage share at events that do not feature McGregor. Under this fact pattern, the implied "McGregor effect" on the wage share is zero (equal to  $0.2 - 0.2$ ), because Zuffa itself is responsible for the lion's share of incremental revenue at events featuring McGregor. Instead of interpreting this as evidence of Zuffa's ability to exercise monopsony power over McGregor, my analysis assumes that the McGregor effect would remain fixed at zero in the but-for world.



independent of Fighters, let alone that these non-Fighter inputs somehow shrank the proportion of Event Revenue attributable to Fighters. Despite the absence of any plausible basis for Zuffa's and Dr. Topel's new claim that certain unspecified and undocumented promotional activities by Zuffa have, over time, diminished, rather than enhanced, the relative revenue-generating ability of its Fighters, I have performed additional analyses to refute it. Specifically, I re-specified my impact regressions, adding variables that control for any expenditures that plausibly could be classified as "investments and efforts in increasing the value of the events and athletes it promotes."<sup>96</sup> Using Zuffa's financial records, I calculated Zuffa's promotional expenditures per bout,<sup>97</sup> and included it as a new control variable in my impact regressions. As shown in the Appendix, the impact regressions continue to find a negative and significant relationship between Zuffa's foreclosure share and the wage share, just as before. Moreover, the coefficient on Zuffa's promotional expenditures is statistically indistinguishable from zero in all specifications. This confirms once again that there is no evidence that Zuffa's promotional activities have increased the revenue-generating ability of non-Fighter inputs relative to Fighters.

**C. The Levels-Based Analyses Proffered by Zuffa's Economists Remain Fatally Flawed, and Dr. Topel's New Defense of Them Is Without Merit**

34. Zuffa's economists assert that compensation levels, rather than wage shares, are the appropriate focus of analysis here.<sup>98</sup> As my rebuttal report explained, such an approach is fatally flawed.<sup>99</sup> Analyzing compensation levels in isolation would hide the fact that Fighter compensation is growing at a slower rate than the revenues that Fighters are generating for Zuffa:

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96. Topel Surrebuttal Report ¶8.

97. I calculated promotional expenditures using count line items which explicitly relate to marketing, promotions, or advertising (e.g., "Branding," "PPV Advertising," "Event Promos," "Digital Marketing," and "Other Ad Broadcast Costs," etc.). See Zuffa Consolidated Financial Statements.

98. Topel Report ¶¶142-149; Oyer Report ¶¶47-50.

99. Singer Rebuttal Report ¶¶111-114.

Under the levels-based framework advocated by Zuffa's economists, if Zuffa's Event Revenue increased by 900 percent (a factor of ten), while Fighter compensation increased by only one percent, this would be falsely construed as evidence that monopsony power has *not* been exercised.<sup>100</sup> Moreover, Dr. Topel's sole attempt to incorporate Event Revenue into his levels-based analysis is fatally flawed; it assumes that the Challenged Conduct had no effect on the proportion of Event Revenue paid out to Fighters as compensation, and thus assumes away the effect of the Challenged Conduct.<sup>101</sup> Yet Zuffa's *Daubert* motion claims falsely that "there is no finding of injury or damages"<sup>102</sup> when a levels-based analysis is performed. This is incorrect; all levels-based analyses proffered by Zuffa's economists are fatally flawed, and no meaningful inferences regarding impact or damages can be drawn from them one way or the other.

35. In his Surrebuttal, Dr. Topel claims that the fact that his levels-based analysis assumes away the effect of the Challenged Conduct "is a virtue, not an indictment."<sup>103</sup> Dr. Topel is wrong; indeed, his own results show the flaws in his methods. According to Dr. Topel's own model, when Event Revenue increases, Zuffa shares only a tiny fraction of that increase with its Fighters: According to Dr. Topel's levels-based analysis, a one percent increase in Event Revenue is predicted to increase Fighter compensation by just 0.08 percent.<sup>104</sup> This is based on the average

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100. *Id.* ¶¶39; ¶94. Sports economists have recognized this defect of levels-based analyses. *Id.* ¶94.

101. *Id.* ¶¶115-120. The levels-based regressions proffered by Zuffa's experts also suffer from a technical econometric problem known as endogeneity. *Id.* Dr. Topel claims falsely that I did "nothing to explain what these sources of endogeneity might be." Topel Surrebuttal ¶12. My rebuttal report explains why Dr. Topel's econometric model is biased and unreliable as a result of endogeneity. Singer Rebuttal ¶¶118-119. Professor Manning reaches the same conclusion. *See* Manning Rebuttal ¶30 ("The technical term used by econometricians for this problem is "endogeneity" or "measurement error" in an explanatory variable. By introducing an explanatory variable that can only measure MRP with significant error, Dr. Topel potentially introduces bias into all of his regression coefficients. In contrast, Dr. Singer's approach avoids this problem and so is the correct methodology.").

102. Zuffa *Daubert* Brief re Dr. Hal Singer at 2.

103. Topel Surrebuttal Report ¶11.

104. Topel Report Exhibit 13, columns (4) – (6). Dr. Manning testified that this effect is so implausibly small that Dr. Topel "should have had alarm bells going off in his head." Deposition of Alan Manning 129:13-23 ("I mean, if you look at Dr. Topel's regression, . . . the consequence of this endogeneity would be that the coefficient gets biased

extent to which Zuffa passes through revenue increases to its Fighters, controlling for Zuffa's foreclosure share. Dr. Topel's model assumes that this tiny estimate is entirely the result of competitive forces, thus assuming away the effect of the Challenged Conduct on the way in which incremental revenues are translated into incremental wages.

36. To illustrate, suppose that Zuffa's Event Revenue is \$1 million per event in 2010, and that Fighter compensation is collectively \$200,000 per event, implying a wage share of 20 percent as of 2010.<sup>105</sup> Suppose that Event Revenue doubles, increasing to \$2 million per event in 2015, and that Zuffa's foreclosure share also doubles from 2010 to 2015. Although Zuffa's Event Revenue has increased by 100 percent,<sup>106</sup> Dr. Topel's model predicts that, *under competitive conditions*, Fighter compensation should increase by only about 8 percent,<sup>107</sup> from \$200,000 per event to \$216,000 per event.<sup>108</sup> This implies a dramatic decline in Fighters' wage share, from 20 percent to just 11 percent.<sup>109</sup>

37. Critically, Dr. Topel's model assumes that this paltry payout to Fighters is *unrelated* to the Challenged Conduct. Put differently, Dr. Topel's model *assumes* that declining Fighter wage shares are the result of competitive forces, rather than the Challenged Conduct. For Dr. Topel to find evidence that the Challenged Conduct reduced compensation, it would have to be the case that Fighter compensation increased by *even less* than the meager 8 percent predicted by his model. Equivalently, the wage share would have to fall *below* 11 percent. Moreover, if the

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towards zero, meaning that it's much smaller than it truly is. And when he estimates coefficient, which is about .08, I think he should have had alarm bells going off in his head that there was something wrong with it.”).

105. Equal to \$200,000/[\$1 million].

106. Equal to [\$2 million - \$1 million]/[\$1 million].

107. As noted above, a one percent increase in Event Revenue is associated with a 0.08 percent increase in Fighter compensation; therefore, a 100 percent increase in Event Revenue is associated an increase in Fighter compensation of approximately 8 percent.

108. Equal to \$200,000 x [1.08].

109. Equal to \$216,000/[\$1 million].

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wage share actually declined “only” to (say) 15 percent, then Dr. Topel’s model perversely implies that the doubling of Zuffa’s foreclosure share from 2010 to 2015 resulted in *higher* Fighter compensation. (Indeed, this is precisely what Dr. Topel’s levels-based analysis finds).<sup>110</sup> In contrast, my own analysis makes no such implausible assumption. Instead, it tests the hypothesis that declining Fighter wage shares are driven by Zuffa’s share of Fighters locked up into long-term restrictive contracts, and finds that this is indeed the case.

## II. DR. TOPEL’S MYRIAD NEW AND RECYCLED FALSE CLAIMS SHOULD BE REJECTED

38. As explained below, Dr. Topel’s Surrebuttal Report and Zuffa’s *Daubert* motion include myriad additional false claims. Some are new; others are recycled from Dr. Topel’s first report. All should be rejected.

39. Both my initial report and rebuttal report explained that I performed standard statistical tests confirming that Zuffa’s foreclosure did not significantly affect the wage shares of pre-acquisition Strikeforce Fighters. That finding, which Dr. Topel never disputed or even addressed, bolstered my finding that the wage shares paid to pre-acquisition Strikeforce Fighters provide a good benchmark for the wage share that would be observed in the but-for world.<sup>111</sup> In other words, that Strikeforce did not adjust its wage share in response to changes in Zuffa’s foreclosure share implies that Strikeforce’s wage share serves as a reasonable benchmark for a more competitive but-for world. Accordingly, my impact regression model is specifically constructed to reflect that Zuffa’s foreclosure share did not affect the proportion of Event Revenue paid to pre-acquisition Strikeforce Fighters. The way I operationalized this finding was by setting the foreclosure coefficient equal to zero for pre-acquisition Strikeforce bouts—or, equivalently,

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110. See Topel Report Exhibit 13.

111. Singer Rebuttal Report ¶75, n. 274; *id.* ¶84; Singer Report ¶¶182-183; *id.* n.454.

setting the foreclosure share to zero for these bouts.<sup>112</sup> In his Surrebuttal Report, Dr. Topel claims for the first time (and without citation to any authority) that specifying my impact regression in this way is “completely arbitrary,”<sup>113</sup> because it “assumes that Zuffa had no athletes under contract.”<sup>114</sup> Similarly, Zuffa claims that my impact regression implies “that Zuffa had no athletes under contracts of 30 months or greater.”<sup>115</sup> These critiques are baseless; I make no such assumptions. Because I ran separate statistical tests confirming that Zuffa’s foreclosure share did not affect the share of Event Revenue paid to pre-acquisition Strikeforce Fighters,<sup>116</sup> it follows automatically that Strikeforce paid its Fighters the same share of Event Revenue that it would have if Zuffa’s foreclosure share were zero. In other words, using a separate statistical test (unrebutted by Dr. Topel), I determined that Strikeforce’s Fighter wage share was unaffected by the Challenged Conduct. My impact regressions merely reflect this logical implication of my unrebutted statistical tests.

40. Dr. Topel also repeats his false claim that my impact regression yields “no evidence of anticompetitive impact”<sup>117</sup> if the Strikeforce pre-acquisition bouts are discarded. My rebuttal report explained that this is incorrect; I demonstrate that Zuffa’s foreclosure suppressed the wage share *even if* the Strikeforce pre-acquisition benchmark is improperly discarded from the regression.<sup>118</sup>

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112. Singer Report ¶183 (“The variable  $D_{jt}^z$  is set equal to one for all Zuffa events, and to zero for non-Zuffa events (that is, Strikeforce events prior to Zuffa’s acquisition of Strikeforce).”); *id.* n.454 (“The coefficient  $\alpha$  was found to be statistically insignificant, indicating that Zuffa’s foreclosure affected the Fighter Shares of Zuffa Fighters, but not Strikeforce pre-acquisition Fighters.”).

113. Topel Surrebuttal Report ¶24.

114. *Id.*

115. Zuffa Daubert Brief re Dr. Hal Singer at 23.

116. Singer Rebuttal Report ¶84; Singer Report ¶¶182-183; *id.* n.454.

117. Topel Surrebuttal Report ¶24.

118. Singer Rebuttal Report ¶86.

41. Further, my rebuttal report explained that Dr. Topel misapplied the Chow test by treating it as if it were a license to discard data, which it is not.<sup>119</sup> Dr. Topel claims in his Surrebuttal Report that “Dr. Singer does not dispute the appropriateness of the Chow test used [by Dr. Topel] to determine whether the pre-acquisition Strikeforce bouts should be used to estimate his impact regression.”<sup>120</sup> This is false; my rebuttal report explained that the Chow test is *not* an appropriate basis for excluding data.<sup>121</sup> Dr. Topel also claims falsely that “the Chow test is, in fact, expressly designed to identify situations in which certain data should not be used to estimate an econometric model.”<sup>122</sup> Once again, Dr. Topel provides no citation to any authority to support using the Chow test as a basis for discarding data, just as he failed to provide any support for this claim in his prior report.<sup>123</sup>

42. Statistical tests performed in my initial report and in my rebuttal report confirmed that Strikeforce is a valid statistical benchmark that belongs in my impact regressions.<sup>124</sup> In his Surrebuttal, Dr. Topel criticizes a statistical test performed in my rebuttal report which demonstrated that, of the 63 coefficients that Dr. Topel subjects to the Chow test, 19 are statistically identical for Strikeforce pre-acquisition bouts and Zuffa bouts.<sup>125</sup> None of these 63 coefficients is directly relevant to proving impact or measuring damages, because none of them measure the effect of Zuffa’s foreclosure share on the wage share; instead, they measure the effect

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119. *Id.* ¶¶80-83.

120. Topel Surrebuttal Report ¶25.

121. Singer Rebuttal Report ¶¶80-83.

122. Topel Surrebuttal Report ¶28.

123. *Id.* ¶25; Singer Rebuttal Report ¶82.

124. Singer Report ¶¶182-183; *id.* n. 454; Singer Rebuttal Report ¶¶84-85. The statistical tests I performed are known as *F*-tests. The Chow test is a particular type of *F*-test. *Id.* ¶84, n. 297.

125. Topel Surrebuttal Report ¶26.

of other factors on the wage share (such strikes landed, prior wins, etc.).<sup>126</sup> Dr. Topel is merely quibbling about whether the effect of (for example) a Fighter's prior wins on her wage share is identical for Zuffa bouts and Strikeforce pre-acquisition bouts.<sup>127</sup> In any case, Dr. Topel wrongly asserts in his Surrebuttal, without citation to any authority, that I was incorrect to characterize these 19 coefficients as statistically identical for Strikeforce pre-acquisition bouts and Zuffa bouts.<sup>128</sup> This is exactly what the statistical test demonstrates: The null hypothesis that the coefficient is zero on *all* of the 19 interaction terms cannot be rejected.<sup>129</sup> If all of these interaction terms are zero, this means that there is no statistically significant difference between the Zuffa coefficients and the Strikeforce coefficients for these 19 variables. This substantial overlap between the Zuffa coefficients and the Strikeforce coefficients provides further confirmation that it would be improper to discard the Strikeforce pre-acquisition data; it means that pooling the Zuffa data and Strikeforce pre-acquisition data will result in more statistical precision.<sup>130</sup> Including the additional data—particularly when there is no statistically significant difference in the coefficients for numerous variables between the two data sets—improves the reliability of the results.

43. Dr. Topel also claims, again without citation to any authority, that the application of these standard statistical tests in my rebuttal report constitutes “statistical gerrymandering.”<sup>131</sup> He is wrong. Dr. Topel does not dispute any of the mechanics of the standard statistical tests that I

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126. This is why the statistical tests in my initial report focused on the foreclosure coefficient. Singer Rebuttal Report ¶¶84-85; Singer Report ¶¶182-183; *id.* n. 454. My initial report used a standard *F*-test to confirm “that Zuffa’s foreclosure affected the Fighter Shares of Zuffa Fighters, but not Strikeforce pre-acquisition Fighters.” *Id.*

127. Singer Rebuttal Report ¶¶84-85.

128. Topel Surrebuttal Report ¶26.

129. Singer Rebuttal Report ¶85. *See also* Wooldridge at 143-148 (explaining that the *F* test is used to test the null hypothesis that all of the coefficients on each member of a group of variables are equal to zero, and therefore do not belong in the model).

130. Singer Rebuttal Report ¶84. Dr. Topel admitted at his deposition that even if (hypothetically) 2013 Zuffa bout data were different from the rest of the Zuffa bout data sample per a Chow test, it would be better to include those than to exclude them. Topel Dep. at 311:4-13.

131. Topel Surrebuttal Report ¶¶25-26.



implement. Instead, he claims not to have understood why that particular hypothesis was tested.<sup>132</sup> As should have been clear to Dr. Topel from my backup code, the 19 variables were selected according to standard methods, designed to test whether groups of variables belong in a regression model based on their explanatory power.<sup>133</sup>

44. Dr. Topel also faults me for the vast number of possible alternative specifications that are the direct implication of his own implementation of the Chow test (and a key limitation of the Chow test generally).<sup>134</sup> Dr. Topel claims that it is possible to “data mine”<sup>135</sup> his alternatives for results that contradict my conclusion that the Challenged Conduct reduced Fighter wage shares. But he fails to do so: According to Dr. Topel’s own preferred specification, which constraints 15 coefficients (rather than 19 coefficients) to zero,<sup>136</sup> Zuffa’s foreclosure share remains negatively and significantly related to the wage share.<sup>137</sup> Dr. Topel’s failure to identify a single contrary

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132. *Id.* ¶26.

133. Wooldridge at 143-148 (explaining that the *F* test is used to test whether a group of variables should be included in a model, based on their explanatory power). As seen in my backup code, the 19 interaction terms fall into two categories. The first consists of six variables measuring the way in which a bout ended (*e.g.*, knockout, submission, etc.). The second of these categories consists of 13 FightMetric variables measuring a Fighter’s performance (*e.g.*, strikes landed, strikes attempted, etc.). As the backup code to my rebuttal report demonstrates, the six variables in the first category do not contribute significantly to the explanatory power of the regression ( $F = 1.57$ ;  $p$ -value = 0.15); nor do the 13 variables in the second category ( $F = 0.86$ ;  $p$ -value = 0.60). When the two categories are tested simultaneously, the results confirm that the 19 variables collectively do not contribute significantly to the explanatory power of the regression ( $F = 1.19$ ;  $p$ -value = 0.25).

134. As I explained in my rebuttal report, Dr. Topel tests the null hypothesis that *all* 63 of the regression coefficients for the Strikeforce pre-acquisition bouts are identical to the regression coefficients for the Zuffa bouts: He tests whether all 63 coefficients on these independent variables for the Zuffa bout data *exactly match* all of the 63 coefficients on the independent variables for the Strikeforce bout data. Singer Rebuttal Report ¶81. However, Dr. Topel’s test cannot determine which of the 63 coefficients match and which do not. This is an important limitation of the Chow test. *Id.* (citing Wooldridge at 245). As Dr. Topel calculates in his Surrebuttal, the inability of his Chow test to distinguish which of his 63 interaction terms belong in the regression and which do not leads to a vast number of logically possible alternatives, each of which involves constraining some subset of Dr. Topel’s 63 interaction terms to zero; the total number of possible subsets is equal to  $(2^{63} - 2)$ . Topel Surrebuttal Report ¶26, n. 41.

135. Topel Surrebuttal Report ¶27.

136. *Id.*

137. According to Dr. Topel’s preferred specification, the Challenged Conduct has a negative and economically significant effect on Fighter compensation for all three measures of the Relevant Input Market and Submarket; the effect is statistically significant at conventional levels for two out of three measures of the Relevant Input Market and Submarket. In particular, the coefficient on Zuffa’s foreclosure share is negative and significant at the ten percent level under the Tracked measure (coefficient = -0.03;  $p$ -value = 0.07). Under the Ranked measure, it is negative and



example out of the vast number of alternatives implied by his own analysis actually *confirms* the robustness of my results.

45. My rebuttal report explained that the career lengths of Fighters while at Zuffa, or while competing in the Relevant Input Market and Submarket, are brief (from approximately 0.8 to 2.5 years). It also explained that Dr. Topel's estimate of 8.9 years was incorrect, and was calculated by including the portion of a Fighter's career spent in the minor leagues (which is comparable including a professional athlete's time playing in high school and college when calculating the length of her professional career).<sup>138</sup> In his Surrebuttal, Dr. Topel claims incorrectly that my calculations are "wrong."<sup>139</sup> Dr. Topel does not identify any mathematical error in any of my calculations, including the fact that the median career length for Zuffa Fighters at Zuffa (typically the apex of a Fighter's career) is approximately 0.8 years.<sup>140</sup> Nor can Dr. Topel refute that his 8.9 year statistic relies on the inclusion of bouts in extremely minor promotions that do not have a single athlete ranked between 1 and 650 in *any* weight class, and are therefore outside even the most expansive conceivable definition of the Relevant Input Market (the Ranked definition).<sup>141</sup> Dr. Topel commits this error again in his Surrebuttal, calculating a new and similar career length of 8.7 years by including all bouts, Fighters, and promoters listed on Sherdog.com.<sup>142</sup> As before,

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significant at the one percent level (coefficient = -0.02; *p*-value = 0.01). Under the Headliner measure, the coefficient is negative and significant at the 13 percent level (coefficient = -0.02; *p*-value = 0.13).

138. Singer Rebuttal Report ¶64, Table 1.

139. Topel Surrebuttal Report ¶¶37-41.

140. Singer Rebuttal Report ¶64, Table 1. Dr. Topel claims misleadingly that "the short median career length at Zuffa (0.82 years) indicates that Zuffa typically does not keep athletes even as long as one-third of the median 35-month contract calculated by Dr. Singer and that Zuffa athletes are only contractually unavailable to competitors for short periods of time." Topel Surrebuttal Report ¶41. But the short careers of many Zuffa Fighters simply highlight the fact that Zuffa's contracts are one-way ratchets, with a cut clause that allows Zuffa to drop Fighters that lose even a single bout. Singer Report ¶66.

141. Singer Report ¶¶99-111.

142. Topel Surrebuttal Report ¶40.

this calculation is driven by the inclusion of extremely minor promotions that exceed any reasonable definition of the Relevant Input Market.

46. Dr. Topel claims falsely that I do not describe the methodological errors in his stratified foreclosure-share regressions.<sup>143</sup> My rebuttal report explained that Dr. Topel's stratified foreclosure-share regressions improperly weighted all athletes equally, and improperly excluded Strikeforce pre-acquisition bouts.<sup>144</sup> In addition, Dr. Topel improperly included all of his stratified foreclosure metrics in a single regression; I corrected this error by performing separate regressions for each of Dr. Topel's metrics.<sup>145</sup> Dr. Topel is correct, however, to observe that I performed this analysis using revenue-weighted stratified foreclosure shares.<sup>146</sup> But Dr. Topel fails to disclose that this makes no difference: As seen in the Appendix, when I replicate my analysis using unweighted stratified foreclosure shares, my conclusion that Zuffa's foreclosure share is negatively and significantly related to its wage share is again reaffirmed.

47. Dr. Topel claims falsely that, to "justify"<sup>147</sup> my use of inverse rank weights in my foreclosure calculations, one "needs to establish that the inverse of athletes' ranking is somehow related to Zuffa's ability to foreclose rivals."<sup>148</sup> This is incorrect. The weights used in my foreclosure are not chosen to engender that effect; rather, the weights are based on observed drivers of Fighters' "ability to attract viewers, generate event revenues, and hence their value to an MMA promoter."<sup>149</sup> Thus, my weighting methods are designed to capture differences in the

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143. *Id.* ¶30.

144. Singer Rebuttal Report ¶59; ¶122.

145. *Id.* Table A3.

146. Topel Surrebuttal Report ¶30.

147. *Id.* ¶44.

148. *Id.* ¶44.

149. Singer Rebuttal Report ¶128.

quality of Fighters across different MMA promoters.<sup>150</sup> Because these weights generate foreclosure measures that can be shown (all else equal) to decrease Fighter wage shares, the weights can be said to capture Zuffa's ability to foreclose rivals. Dr. Topel also claims incorrectly that my rank-based weights "misleadingly mask[] the variation in compensation at the individual athlete level by running the regression using average compensation by ranking."<sup>151</sup> But the purpose of my weights is to distinguish between the relative quality of athletes (and thus pools of athletes) at different promoters.<sup>152</sup> None of my foreclosure calculations is specific to individual Fighters; the weights assigned to Zuffa and non-Zuffa promoters depend on all of the Fighters associated with each. Thus, what matters for my weighted foreclosure calculations is that they reflect differences in the average quality of Fighters at Zuffa versus the average at other MMA promoters.

48. Zuffa claims falsely that my foreclosure metric, which captures labor market restrictions, is divorced from other standard metrics of market power used in the economic literature and in antitrust-related litigation.<sup>153</sup> As my rebuttal report explained, economists have used both labor market restrictions (which my foreclosure share is explicitly designed to capture) and measures of market concentration (closely related to my foreclosure share) to analyze market power in the labor market.<sup>154</sup> In *High Tech Employee*, plaintiffs' economist (Professor Leamer) used a foreclosure measure calculated using anti-solicitation agreements—that is, using contracts among Defendants. Specifically, Professor Leamer measured the alleged anticompetitive conduct as the proportion of months out of a given year during which a Defendant was subject to one or

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150. *Id.*

151. Topel Surrebuttal Report ¶47.

152. Singer Report ¶128.

153. Zuffa Daubert Brief re Dr. Hal Singer at 2, and at 13; *see also* Topel Surrebuttal Report ¶22.

154. Singer Rebuttal Report ¶¶95-102; ¶104; ¶107 (articles listed in n. 16, *supra* and in n. 17, *supra*).

more of the challenged anti-solicitation agreements.<sup>155</sup> This is directly analogous to my own, contract-based measure of foreclosure.<sup>156</sup>

49. Zuffa also claims falsely that I defined the relevant input markets improperly by focusing on sellers (athletes) instead of buyers (promoters).<sup>157</sup> This is incorrect; as my prior reports make clear, I defined the relevant input market by determining the extent to which MMA promoters other than Zuffa do or do not offer “comparable competitive alternatives to which MMA Fighters could reasonably substitute to counteract an exercise of (buyer) market power by Zuffa.”<sup>158</sup> But I distinguish between promoters by their most important feature: the talent and quality of their respective rosters of Fighters. Thus, the analysis *is* performed from the perspective of Fighters, but the markets are defined to include promoters. Fighters’ willingness to substitute from one MMA promoter to the next depends critically on the career opportunities at each promoter, which in turn depends on the set of Fighters (that is, opponents) each promoter can

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155. Kevin Caves & Hal Singer, *Analyzing High-Tech Employee: The Dos and Don’ts of Proving (and Disproving) Classwide Antitrust Impact in Wage Suppression Cases* 14(3) ANTITRUST SOURCE (February 2015), at 4 [hereafter, “Caves & Singer (2015)”].

156. In its Daubert Brief attacking my work, Zuffa cites *High-Tech Employee* to support its economists’ claim that “the standard way to evaluate compensation in an allegedly monopsonized labor market is by running regressions using the actual compensation, not wage share, as the dependent variable.” Zuffa Daubert re Dr. Hal Singer at 13. As I explained in my rebuttal report, plaintiffs’ economist in *High-Tech Employee* was justified in using compensation levels as his dependent variable, and including employer revenue as a control variable, because his revenue data was limited to *total corporate revenue* for large companies such as Apple, Adobe, and Google. Singer Rebuttal Report ¶120. The annual compensation received by an individual technical employee would represent a miniscule fraction of total corporate revenue. (For example, the share of Apple’s total corporate revenue paid to any individual technical employee is effectively zero). Thus, given the data available, it would not have made sense to calculate labor share as the dependent variable in plaintiffs’ regression model in *High-Tech Employee*. In contrast, the revenue that Zuffa earns *at a particular event* plainly measures the revenue contribution of Fighters *at that event*. *Id.* Professor Manning reached the same conclusion. See Manning Rebuttal ¶22 (“In many situations where one could compute worker share, it is often at too aggregated a level to be useful as a measure of compensation relative to the marginal revenue product...A case in point is the *High Tech Employee* case...there would have been no data measuring the contribution to firm revenue of the class of high-tech employees in that case (the available revenue data consisted of, e.g., Apple’s total global corporate revenue). Therefore, it would not have been possible to construct a wage share variable comparable to the wage share variable used by Dr. Singer in this case (which, as explained below, is constructed using event-specific revenue data).”).

157. Zuffa Daubert re Dr. Hal Singer at 4.

158. Singer Report ¶100.

offer.<sup>159</sup> Each of my three measures of the Relevant Input Market and Submarket captures different sets of promoters.<sup>160</sup> Zuffa also claims falsely that my market definition analysis turned entirely on record evidence.<sup>161</sup> Although it is true that I extensively analyzed record evidence and industry databases, I did so by applying standard antitrust principles, referencing the relevant literature where appropriate.<sup>162</sup> I also demonstrated that non-Zuffa promoters are at best distant substitutes from the perspective of Fighters, owing to diminished compensation and career opportunities.<sup>163</sup> For the relevant geographic market, I also demonstrated that Zuffa can charge North American customers at least five times as much as promoters outside of North America.<sup>164</sup> I also demonstrated Zuffa's ability to profitably implement price increases, confirming that my definition of the relevant output market is conservative.<sup>165</sup> Finally, Zuffa's ability to suppress Fighter compensation below competitive levels (demonstrated by my impact regressions and other analyses), confirms that my definition of the relevant input market is also conservative.<sup>166</sup>

50. In my initial report, I estimated regressions demonstrating that the average annual compensation per event for individual Zuffa Fighters was positively and significantly related to the average annual compensation paid to all other Zuffa Fighters. This provides further evidence of a compensation structure, and therefore of common impact flowing from generalized compensation suppression.<sup>167</sup> My rebuttal report explained that Dr. Topel improperly discarded all pre-Class

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159. *Id.* ¶99, citing *Merger Guidelines* §12 (In the buying context, market definition turns on “the alternatives available to sellers in the face of a decrease in the price paid by a hypothetical monopsonist.”). *See also id.* ¶104 (explaining that non-Zuffa promoters are not close substitutes from Fighters’ perspective); *id.* Part III.A.1.

160. Singer Report Part III.A.1.

161. Zuffa Daubert Brief re Dr. Hal Singer at 5.

162. Singer Report ¶¶95-98.

163. *Id.* ¶100; *id.* Part III.A.8.

164. *Id.* ¶123.

165. *Id.* ¶¶197-202.

166. *Id.* ¶¶143-144.

167. *Id.* ¶¶228-229.

Period data from this model,<sup>168</sup> and it also performed a standard statistical test demonstrating that an increase in other Fighters' compensation is indeed associated with a positive and statistically significant increase in an individual Fighter's compensation both before and during the Class Period.<sup>169</sup> In his Surrebuttal Report, Dr. Topel claims that I should have used a different statistical test, designed to determine whether "a given model applies to two different data sets,"<sup>170</sup> one from before the start of the Class Period and one from after.<sup>171</sup> Dr. Topel is incorrect: Here there are not two Zuffa data sets, but instead a single data set consisting of Zuffa's Fighter compensation data from all available time periods, from 2005 through 2016.<sup>172</sup> As far as Zuffa's compensation practices are concerned, the start of the Class Period is simply an arbitrary legal delineation (as I understand it, having to do with the statute of limitations under the antitrust laws) with no bearing on Zuffa's compensation structure. Therefore, the statistical test implemented in my rebuttal report was the correct one.

51. Dr. Topel also claims that my summary of an article by Autor et al. is "misleading"<sup>173</sup> because "Autor et al. conclude that the decline in labor's share of GDP has been driven by procompetitive (rather than anticompetitive) activity—the growth of superstar firms."<sup>174</sup> Dr. Topel is incorrect. *First*, as I pointed out in my rebuttal, that the authors of the study would even entertain the hypothesis that declining labor shares reflect anticompetitive conduct—let alone conduct an in-depth empirical analysis of labor shares in hundreds of industries to explore it—

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168. Singer Rebuttal Report ¶161.

169. *Id.* ¶162.

170. Topel Surrebuttal Report ¶35.

171. *Id.* ¶36.

172. Singer Report ¶¶228-229; *id.* Table 7.

173. Topel Surrebuttal Report ¶18.

174. *Id.*

contradicts Dr. Topel's prior categorical claims regarding the use of labor shares by economists.<sup>175</sup> *Second*, the authors certainly do not conclude that monopsony power cannot be invoked to explain declining labor shares in *any* industry; their findings relate to effects measured at the average across hundreds of industries.<sup>176</sup> *Third*, the authors do not rule out the possibility that superstar firms are able to exercise monopsony power with respect to labor, which could explain why the bulk of their increased productivity has not been passed on in the form of higher compensation. *Fourth*, Dr. Topel ignores other studies cited in my rebuttal report that explicitly link the observed decline in the labor share to a lack of competition, using multi-industry data comparable to Autor et al.<sup>177</sup>

### CONCLUSION

52. For the foregoing reasons, nothing in Dr. Topel's Surrebuttal undermines any of the conclusions of my initial report or my rebuttal report.

\* \* \*



Hal J. Singer

Executed on April 3, 2018.

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175. Singer Rebuttal Report ¶104.

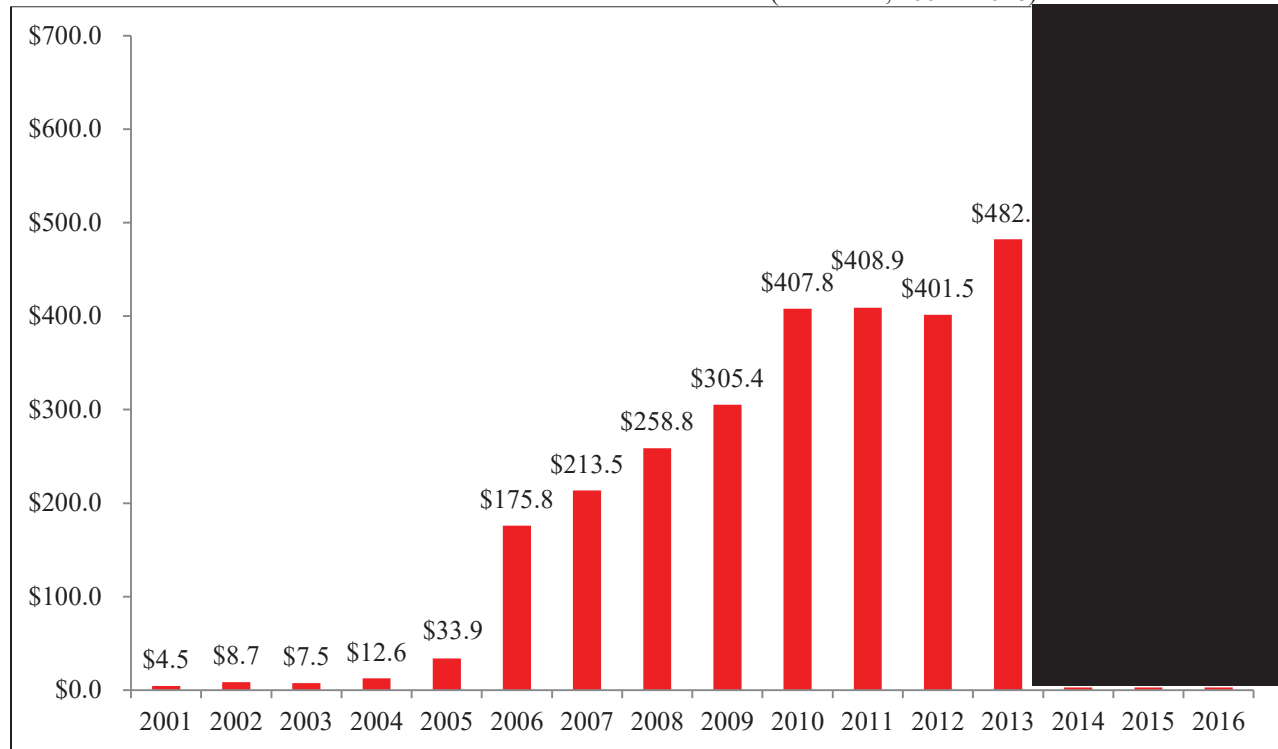
176. *Id.*

177. *Id.* ¶107 (citing Barkai; De Loecker & Eeckhou; Elsby et al.).

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## APPENDIX: FIGURES AND TABLES

FIGURE A1: ZUFFA'S ANNUAL EVENT REVENUE (MILLIONS, 2001 – 2016)



Source: Backup materials to Singer Report, compiled from Zuffa consolidated annual financial statements.

TABLE A2: IMPACT REGRESSIONS CONTROLLING FOR PROMOTIONAL EXPENDITURES PER EVENT

Explanatory Variable	Dependent Variable: Fighter Share		
	Tracked Market	Ranked Market	Headliner Market
<i>Foreclosure Share</i>	<b>-0.0381**</b>	<b>-0.0231***</b>	<b>-0.0302*</b>
	(0.025)	(0.004)	(0.100)
<i>Promotional Expenses Per Event</i> (Millions - Zuffa)	[Redacted]	[Redacted]	[Redacted]
<i>Promotional Expenses Per Event</i> (Millions - StrikeForce)	-0.0758325	0.2140664	-0.0563763
	(0.907)	(0.736)	(0.933)
Fighter Fixed Effects?	Yes	Yes	Yes
Observations	7,154	7,154	7,154
R-Squared	66%	66%	66%

Notes: Robust p-values in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 These regressions include the same control variables as the original impact regressions reported in Table 6 of my initial report. Promotional expenses are measured by counting any line items that explicitly relate to marketing, promotions, or advertising in Zuffa's Consolidated Financial Statements and in Strikeforce financial documents.

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TABLE A3: IMPACT REGRESSIONS USING DR. TOPEL'S STRATIFIED FORECLOSURE SHARES (UNWEIGHTED)

Explanatory Variable	Dependent Variable: Fighter Share				
	Rank 1 to 15	Rank 16 to 30	Rank 31 to 50	Rank 51 to 100	Rank 101 +
<i>Tracked Foreclosure Share</i>	-0.0332* (0.0709)	-0.0382* (0.0590)	-0.0347* (0.0745)	-0.0356* (0.0705)	-0.0431* (0.0717)
<i>Ranked Foreclosure Share</i>	-0.0457* (0.0700)	-0.0558* (0.0786)	-0.0602* (0.0812)	-0.101* (0.0781)	-0.306* (0.0503)
Fighter Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Observations	7,154	7,154	7,154	7,154	7,154

Notes: Robust p-values in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1 The output above is from a total of ten separate regressions, and reflects corrections to Exhibit 16 of Dr. Topel's report. The first five regressions correspond to the first column of Topel Exhibit 16 (which uses the Tracked measure); the second five regressions correspond to the second column of Topel Exhibit 16 (which uses the Ranked measure). I corrected Dr. Topel's analysis by (1) running separate regressions for each of Dr. Topel's five "stratified" foreclosure metrics; and (2) including Strikeforce pre-acquisition bouts (which Dr. Topel had no basis for excluding). These regressions include the same control variables as the original impact regressions reported in Table 6 of my initial report.

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**APPENDIX: MATERIALS RELIED UPON**

Deposition of Alan Manning, February 8, 2018

Deposition of Paul Oyer, November 29, 2017

Deposition of Robert Topel, December 5-December 6, 2017

Expert Report of Hal J. Singer, Ph. D., Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC, Case No. 2:15-cv-01045-RFB-PAL (D.Nev.) (August 31, 2017)

Expert Report of Paul Oyer, Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC, Case No. 2:15-cv-01045-RFB-PAL (D.Nev.) (October 27, 2017)

Expert Report of Professor Robert H. Topel, Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC, Case No. 2:15-cv-01045-RFB-PAL (D.Nev.) (October 27, 2017)

Expert Report of Roger D. Blair, Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC, Case No. 2:15-cv-01045-RFB-PAL (D.Nev.) (November 15, 2017)

Expert Rebuttal Report of Alan Manning, Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC, Case No. 2:15-cv-01045-RFB-PAL (D.Nev.) (January 12, 2017)

Rebuttal Expert Report of Hal J. Singer, Ph.D., Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC, Case No. 2:15-cv-01045-RFB-PAL (D.Nev.) (January 12, 2017)

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Zuffa Consolidated Financial Statements

Zuffa, LLC's Motion to Exclude the Testimony of Dr. Hal Singer under Fed. R. Evid. 702 and Daubert, Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (February 16, 2018)

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